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de Boer, J.

published in
Water Science and Technology
2007

DOI (link to publisher)
10.2166/wst.2007.538

document version
Peer reviewed version

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Boer, J. de

Water Science and Technology, 56(4), 71-78

Framing climate change and spatial planning: how risk communication can be improved

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Presented at the International Water Association Conference "Innovations in coping with water and climate related risks" Amsterdam, 25-27 September 2006
Water Science & Technology, 56, 4, 71-78, August 2007 [doi:10.2166/wst.2007.538]

Abstract
Taking the role of frames into account may significantly add to the tools that have been developed for communication and learning on complex risks and benefits. As part of a larger multidisciplinary study into climate-related forms of sense-making this paper explores which frames are used by the citizens of Western European countries and, in particular, the Netherlands. Three recent multi-national public opinion surveys were analysed to examine beliefs about climate change in the context of beliefs about energy technology and concerns about other environmental issues, such as natural disasters. It appeared that many citizens had only vague ideas about the energy situation and that these do not constitute an unequivocal frame for climate issues. In contrast, the results suggest that the long-lasting rainfall and severe floods in Central Europe have had a significant impact. Climate change was often framed in a way that articulates its associations with rain- and river-based problems. This result is extremely important for risk communication, because especially in the Netherlands with its vulnerable coastal zones climate change may produce much more consequences than rain- and river-based problems only.
Keywords climate change, frames, natural disasters, public concerns, sense-making

INTRODUCTION

Climate change is a topic that can be framed and reframed in many ways. In the early 1990s, for example, many citizens of the developed countries saw global climate change as an issue with potentially serious but geographically and psychologically distant consequences (Bord, Fisher, & O'Connor, 1998; Bostrom, Morgan, Fischhoff, & Read, 1994; Kempton, Boster, & Hartley, 1995). Since then, however, various salient events, such as unusually long-lasting rainfall and severe floods in Europe, may have contributed to a reframing of the issue in terms of consequences that are much closer to people's personal lives. This change may be happening through a process of formal and informal risk communication in which risks that were largely implicit are reframed into more explicit risks. As this process will not stop here, it is particularly important to get more insight into the frames that people use to make sense of climate-related issues. In general, *sense-making* is what people do to make things rationally accountable to themselves and others (Weick, 1995), and *frames* are underlying structures of belief, perception and appreciation (Schön & Rein, 1994) that mediate their understanding of the world. Accordingly, taking the role of frames into account may significantly add to the tools that have been developed for communication and learning on complex risks and benefits. As part of a larger multidisciplinary study into climate-related forms of sense-making this paper explores which frames are used by the citizens of different European countries and, in particular, the Netherlands.

One of the primary reasons to study framing and sense-making is that these social-psychological processes may reveal how people's ongoing behaviour is shaped by the cultural and ecological circumstances in which they live. Framing and sense-making are crucial micro-mechanisms in the much bigger story of the continuous interactions between humans and the nonhuman natural

world. Because these processes take many years to develop, it is important to combine the short-term perspective of case studies with the long-term perspective provided by theoretical insights. Although the literature about frames and sense-making has not produced a complete theory, there is a set of properties (Weick, 1995) that altogether describe its main features. A very important property is that sense-making is inherently *retrospective*. In the process of making up their mind people will habitually look backwards, using distinctions and concepts that are familiar to them and that they share with their peers. Actually, most people are only discontinuously able and willing to re-examine and revise pre-existing concepts. Re-examination processes have to be triggered by special conditions, such as an unexpected event that stimulates people to modify their frames and create new ways of understanding (e.g. an awareness of multiple perspectives). Only if people become mindful of what they are doing (Langer, 1989), they may develop new concepts or new combinations of existing concepts, such as associations of climate change with specific types of danger.

Another important aspect of sense-making is the often neglected discrepancy between what people think they are doing and what others see them do. This means that the frame of an actor is basically different from the frame of an observer. A risk-relevant example is the difference between the frame of people who are coping implicitly with a risk that is inherent in their line of behaviour, such as living below sea level, and the frame of an expert in risk analysis who isolates their risk and makes it more explicit. A direct comparison of the two frames can be very helpful for the choice of more adaptive behaviour, but it may also result in serious failures of risk communication. One of the communication problems is that people who are trying to make sense of what is happening around them are more interested in information about the *plausibility* of all kinds of options than in very precise calculations of one risk. A closely related problem is the difference between a conventional frequency-oriented frame and a more advanced probability-oriented frame (Gigerenzer, 1991). A probability-oriented frame may not have to be changed if a low-probability flood happens, but a frequency-oriented frame is liable to sudden swings after such an event; a type of flood that was once implausible may seem very plausible now.

Notions of what is plausible are not just affected by the frequency of events but also by their cultural associations. In the case of people's relationship with nature, a few moral ideas appear to have dominated the history of Europe. According to Glacken (1967), these refer to (1) the idea of a designed earth that constitutes a fit environment for man and other organic life, (2) the idea of geographical influence on the character of human culture ("geographical determinism"), and (3) the idea of man as a geographic agent who changed the earth from its hypothetical pristine condition. In the context of these associations, many unusual natural events were seen as cues that something unpleasant is going to happen ("omen of disaster"). During the *Little Ice Age* (from around 1300 until about 1730), for instance, certain "unnatural" climatic events were not only attributed to large scale deforestation but also to the weather-making abilities of witches (Behringer, 1999). In recent years, anthropogenic climate change has become one of the issues that may concern people in their moral role of responsible citizen or potential victim. However, due to the plausibility of various kinds of human impacts on the earth and the retrospective character of sense-making, many people seem to have confused the relatively new risk of climate change with more familiar environmental risks, such as the depletion of the ozone layer, that were brought to their attention in an earlier stage (Bostrom et al., 1994).

Research into frames should always focus on meaningful comparisons between different sites where sense-making happens. In the case of climate change, for example, more insight into sense-making can be gained by comparing people who live in areas with different ecological and cultural circumstances. Interestingly, several recent multi-national public opinion surveys allow

us to make such comparisons. This refers to some large data sets, such as the Eurobarometer surveys of the European Union, which are not specifically built for research into beliefs about climate change but which can fruitfully be used for that purpose. A particular advantage of the data sets is that beliefs about climate change can be examined in the context of beliefs about energy technology and concerns about other environmental issues, such as ozone depletion and natural disasters. Although some data sets include a large number of countries, it was decided to focus the analysis on the countries that belong to the Roman Catholic and Protestant cultural zones of Western Europe (i.e. the former EU 15 countries minus Greece plus Norway and Switzerland). In addition to the multi-national surveys, a Dutch survey will be analysed to explore what citizens think about one particular climate-related issue in the Netherlands, namely the development of large-scale water reservoirs in the next decades.

METHODS

Three data sets were chosen that allow us to put climate-related sense-making by the citizens of Western European countries in a broader energy and environment perspective. These are (1) the International Social Survey Program (not including Italy, France, Belgium, Luxembourg), largely conducted in 2000 by independent institutions in each country and focused on attitudes toward the environment (ISSP, 2003); (2) parts of Eurobarometer 57 (not including Norway and Switzerland), conducted between 23 February and 4 April 2002 and focused on attitudes towards energy and energy technology (European Commission, 2003); and (3) parts of Eurobarometer 58 (not including Switzerland), conducted between 1 September 2002 and 7 October 2002 (after the August 2002 flooding in the Elbe and the Danube catchment areas) and focused on attitudes towards the environment (European Commission, 2002). The data sets were documented and made available by the "Zentralarchiv für empirische Sozialforschung, Köln". From each set, the most relevant questions about climate-related beliefs and concerns were taken.

Clearly, multi-national data should be handled with great care. A crucial methodological point is that each country should be seen as a *set* of conditions, such as latitude, language, religion, education, and wealth (Scheuch, 1989), which makes it difficult to pinpoint exactly how the differences between the countries should be explained. In addition, differences in public opinion between countries are often less stable than the sample sizes (approximately 1000 persons per country) may suggest. To check for flaws, more than one data set should be used. Comparisons may also be hampered by differences in language and ways in which people answer survey questions. For instance, questions that are intended to measure people's level of concern about environmental issues may generate a tendency to show a certain degree of concern about all the issues. In Europe, this tendency may be more widespread in the countries of the south than in those of the north (European Commission, 2002). Therefore, several statistical techniques will be applied to adjust the scores for differences in response tendencies. A useful technique is multiple regression analysis to transform the degree of concern about climate change into standardized residuals that are made independent from concerns about environmental pollution in general. Multidimensional scaling by PROXSCALE (SPSS, 2003) is also a relevant technique, as the results are not influenced by overall score level differences in different groups.

The final part of the analysis focuses on expectations for the future. In 2004, the Social and Cultural Planning Office of the Netherlands gathered data about expectations of the Dutch population for the year 2020 (Sociaal en Cultureel Planbureau, 2006). The expectations were measured as perceived probabilities of particular changes in national and global wealth, safety, energy technology, immigration policy, and spatial planning (i.e. the development of large-scale water reservoirs). The data were analysed by multidimensional scaling to explore the positions of the climate-related topics.

RESULTS AND DISCUSSION

One of the potentially relevant frames to make sense of climate change refers to beliefs about the energy situation. The answers to questions in ISSP 2000 and Eurobarometer 57 show that many people in Western Europe took the issue of climate change seriously and that they saw a connection with the use of fossil fuels. This connection was confirmed by more than 80% of the citizens in five of the countries (second column of Table 1). Although this indicates at least some general understanding of the issue, it should be added that there were also associations that indicate confusion. In agreement with earlier work, it appears that a majority of the citizens in almost all the countries still confused climate change with the depletion of the ozone layer (third column of Table 1). Moreover, many citizens had the opinion that nuclear power also contributes to global warming (fourth column of Table 1). Explicit denial of this impact was higher in countries in the north where the average level of education is higher, but in these countries as well a large percentage agreed (fifth column of Table 1; overall, the correlation between length of education and agreement–disagreement with this item is .17 (N= 15036)). The results underline the conclusion that many citizens of the European Union have only vague ideas about the energy situation (European Commission, 2003); it should be added that these beliefs do not seem to constitute a very useful frame to make sense of climate change.

Table 1 Beliefs about climate change and the energy situation

Country and cultural zone[1])	Greenhouse effect caused by the use of coal, oil, gas[2]) (% agree)	Greenhouse effect caused by a hole in the earth's atmosphere[3]) (% agree)	Nuclear power contributes to global warming[4]) (% agree)	Nuclear power contributes to global warming[5]) (% disagree)
Portugal (a)	68%	62%	59%	10%
Spain (a)	65%	57%	64%	9%
Italy (a)			42%	22%
France (a)			57%	26%
Belgium (a)			48%	27%
Ireland (b)	80%	79%	61%	11%
Luxembourg (b)			57%	27%
Austria (b)	79%	66%	41%	32%
Switzerland (c)	83%	55%		
Germany (c)	76%	69%	39%	35%
Netherlands (c)	74%	49%	34%	46%
United Kingdom (c)	80%	72%	45%	27%
Denmark (d)	75%	50%	24%	58%
Norway (d)	80%	53%		
Sweden (d)	81%	48%	20%	67%
Finland (e)	64%	48%	28%	54%

[1]) (a) Romanic language, Catholic; (b) German language, Catholic; (c) German language, mixed religion; (d) German language, Protestant; (e) Finns (N= about 1000 persons per country).

[2]) % agree with ISSP 2000 Question 9f, "Every time we use coal or oil or gas we contribute to the greenhouse effect."

[3]) % agree with ISSP 2000 Question 9e, "The greenhouse effect is caused by a hole in the earth's atmosphere."

[4]) % agree and [5]) % disagree with Eurobarometer 57 (Spring 2002) Question 9, "Nuclear power contributes significantly to global warming and climate change."

Another way of viewing climate issues is by putting them in the context of all the main environmental issues of our times. In Eurobarometer 58, respondents were asked to indicate their level of worry about 23 environmental issues, ranging from "destruction of the ozone layer" to "industrial waste management." The technique of multidimensional scaling was used to place related worries together and non-related worries further apart. In the solution presented in Figure 1, four dividing lines were drawn on the basis of another analysis (Principal Component Analysis with oblique rotation of the first four correlated components; all Eigenvalues >1). The results of Figure 1 indicate that there were clear patterns of worries among the citizens of the countries involved. In fact, all the environmental worries can be arranged in four broad clusters, which may be characterised as follows. Water pollution (e.g. rivers, coasts, ground and tap water) and industrial disasters (e.g. oil spills) make up the first cluster. The second one refers to some global issues and includes climate change together with natural disasters and the ozone issue. The third cluster contains local issues and topics that appear to worry urban people in particular (e.g. hunting). The fourth cluster largely involves worries about chemicals and waste.

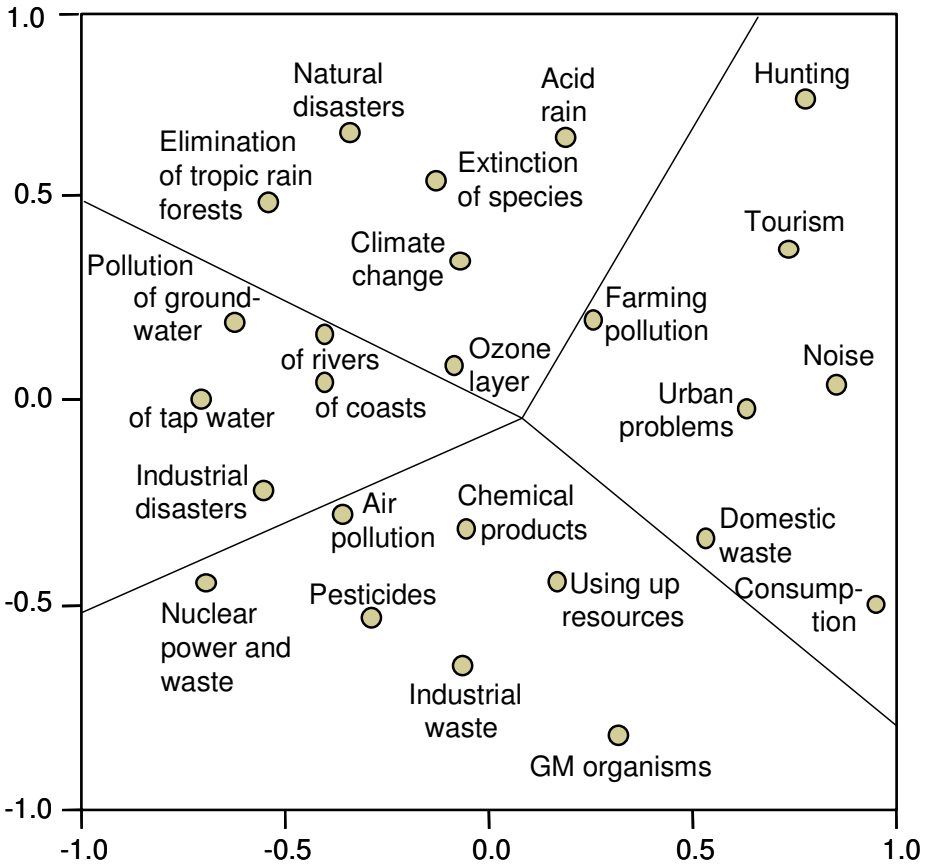

Figure 1 Multidimensional scaling of the worries taken from Eurobarometer 58 (N= 16054).

The information presented in Figure 1 were used to shed more light on the relative level of worry about climate change and natural disasters, given people's level of worry about other kinds of environmental issues. A similar but more simplified analysis was done with the ISSP data set, as five other pollution-related worries were included in the ISSP questionnaire. The results are summarized in Table 2. It appears that the level of worry about climate change was relatively high in the countries of Central Europe, both in 2000 and in 2002 (second and third columns of Table 2). Moreover, this pattern of results corresponds with higher levels of worry about natural disasters and higher correlations between the worries (fourth and fifth columns of Table 2).

Table 2 Relative levels of worry about climate change and natural disasters

Country and cultural zone[1])	ISSP in 2000: Climate change dangerous[2])	Eurobarometer 2002: Worry about climate change[3])	Eurobarometer 2002: Worry about natural disasters[4])	Partial correlations climate change and natural disasters[5])
Portugal (a)	.037	.086	.163	.231
Spain (a)	.076	-.035	.116	.143
Italy (a)	.	.123	-.035	.104
France (a)	.	-.001	.124	.354
Belgium (a)	.	-.130	.016	.287
Ireland (b)	.041	-.305	-.303	.096
Luxembourg (b)	.	.104	.183	.329
Austria (b)	.289	.217	.337	.306
Switzerland (c)	.387	.	.	
Germany (c)	.338	.354	.513	.378
Netherlands (c)	.015	-.076	-.067	.292
United Kingdom (c)	-.022	-.301	-.348	.168
Denmark (d)	-.227	-.189	-.354	.243
Norway (d)	-.169	-.100	-.365	.154
Sweden (d)	-.191	.067	-.271	.129
Finland (e)	-.168	-.042	-.074	.166

[1]) See note 1 of Table 1. N = about 1000 persons per country.
[2]) Standardized residuals of the answers to ISSP 2000 Question 12, "In general, do you think that a rise in the world's temperature caused by the greenhouse effect is: 1 extremely dangerous for the environment (..), 5 not dangerous at all for the environment," given people's level of concern about pollution-related issues.
[3]) Standardized residuals of the answers to Eurobarometer 58 (Autumn 2002), Question 39.2, "At present, are you very worried, fairly worried, not very worried or not at all worried about climate change," given people's level of worry about pollution, chemicals and local issues.
[4]) Standardized residuals of the answers to Eurobarometer 58 (Autumn 2002), Question 39.7, "At present, are you very worried, fairly worried, not very worried or not at all worried about natural disasters," given people's level of worry about pollution, chemicals and local issues
[5]) Partial correlations between worry about climate change and about natural disasters, given people's level of worry about water pollution, chemicals and local issues.

The results of Table 2 should be seen in relation to the long-lasting rainfall and severe floods that have stricken Central Europe since 1990. These events may have had a significant impact on people's worries about climate change. Among the citizens of countries as Austria and Germany, the levels of worry about climate change and natural disaster were relatively high and both items were significantly correlated. In these and other countries (but not in the Netherlands) worry about natural disasters was higher in rural areas than in large towns. Interestingly, another spatial pattern was found in the 12 provinces of the Netherlands. Table 3 shows that the highest correlations between worry about climate change and natural disasters were found in the provinces that are river-oriented (North-Brabant, Limburg) instead of coast-oriented (Groningen, Friesland, North and South Holland, Zeeland). This outcome is not really surprising, as the past decade has revealed that certain parts of the Netherlands are very vulnerable to river-based floods. However, especially in the lowlands with their long coastline, climate change may have much more consequences than rain- and river-based problems only.

Table 3 Worry about climate change and natural disasters, correlations in 12 Dutch provinces

Western provinces		Central axis		Eastern provinces	
Name	Correlation	Name	Correlation	Name	Correlation
		Friesland (N=34)	r= .272	Groningen (N=32)	r= .187
North-Holland (N=155)	r= .251	Flevoland (N=12)	r= .303	Drente (N=69)	r= .200
		Overijssel (N=62)	r= .392		
South-Holland (N=209)	r= .223	Utrecht (N=64)	r= .332	Gelderland (N=115)	r= .164
Zeeland (N=19)	r= .129	North-Brabant (N=143)	r= .431	Limburg (N=69)	r= .405

One of the options that are considered by policy makers in the Netherlands is the development of large-scale water reservoirs in lowland areas that can function as buffers for shortages and overflows. The option was included in the survey about expectations for the year 2020, measured as perceived probabilities of changes in wealth, safety, energy technology, immigration policy, and spatial planning. The multidimensional scale analysis of the data produced a horizontal probability dimension and a vertical optimism-pessimism dimension (Figure 2).

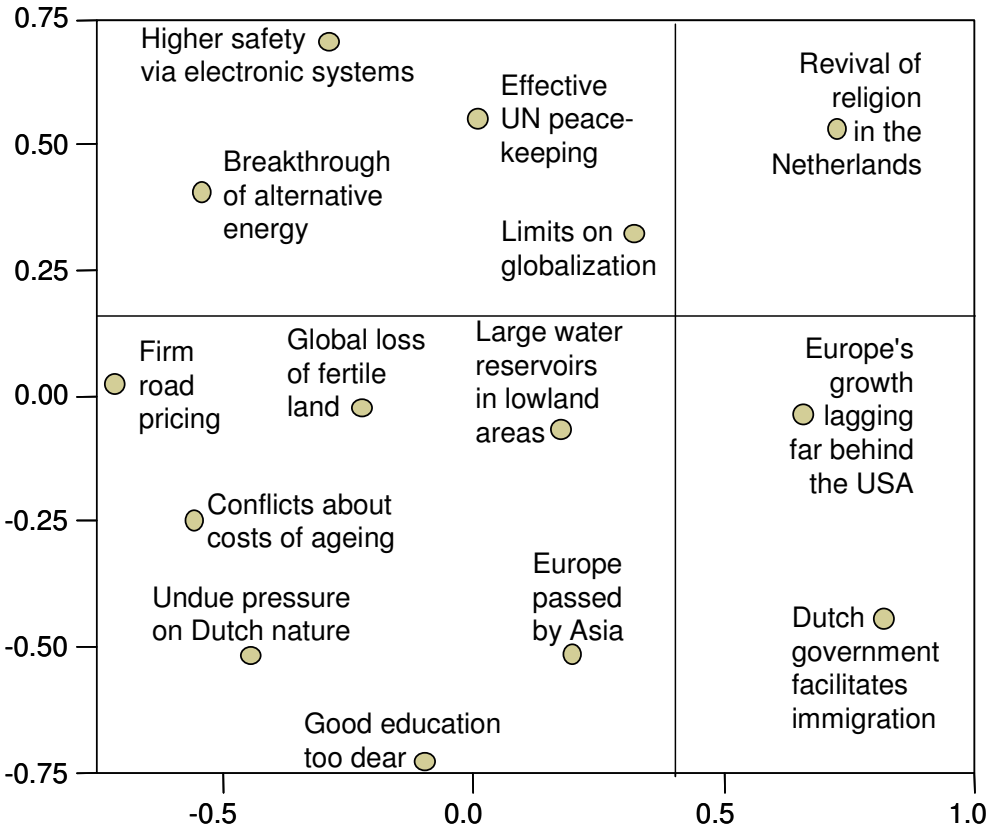

Figure 2 Expectations of a Dutch sample for the year 2020 after scaling (N= 2234)

The horizontal dimension of Figure 2 shows that the Dutch citizens considered the introduction of firm road pricing as very probable but a revival of religion as very improbable. As the vertical dimension demonstrates, they considered technological solutions, including a breakthrough of alternative energy sources, as distinct from pessimistic expectancies, such as undue pressure of housing and recreation on Dutch nature. On average the development of large-scale water reservoirs in lowland areas got a relatively neutral position; it was not part of the optimistic expectancies nor of the real pessimistic ones, and it was not considered very probable. In fact, the results suggest that many citizens have still to make up their mind about the relationship between climate change and spatial planning.

CONCLUSIONS

The surveys have produced valuable insights into climate-relevant sense-making. One of the potentially relevant frames refers to energy, but it appeared that many citizens of Western European countries had only vague ideas about the energy situation. In contrast, the results suggest that the long-lasting rainfall and severe floods in Central Europe have had a significant impact. Climate change was often framed in a way that articulates its associations with rain- and river-based problems. This result is extremely important for risk communication, because especially in the Netherlands climate change may produce much more consequences than rain- and river-based problems only. Many Dutch citizens have still to make up their mind about the relationship between climate change and spatial planning.

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